should choose that one to which he is best adapted and which in his hands gives the maximum consistency.

LLOYD MILLS, M. D. (609 South Grand Avenue, Los Angeles).—The fundamental surgical considerations of glaucoma seldom have been presented more clearly or practically than in this able paper. Doctor Riach's conclusions will meet with the approval of most eye surgeons. Three points are evident in the surgical treatment of glaucoma:

1. All glaucoma should be considered as surgical unless there is prompt therapeutic proof to the contrary, as in simple hypertension without involvement of the optic nerve.

2. The measure of importance in all the filtering-scar operations, whether Lagrange, Reese, or Elliot, is the sclerectomy and the correct formation of its covering flap of conjunctiva.

3. The art of the surgery of chronic glaucoma lies in the adaptation of the form and size of the sclerectomy to the surgical needs of the given case. The presence or absence of inflammatory and exudative changes in the anterior segment and of progressive degenerative changes in the optic nerve, regardless of the degree of hypertension, should determine the form of the operative measure.

I have seen so many of these glaucomatous eyes which have gone blind after inadequate measures that I have long ago given up the Elliot operation in severe cases, believing that the Lagrange, or the Reese operation with sclerectomy, offered the patient the best chance of the maintenance of sight and the mastery of individual hypertension. I cannot believe, out of my own experience, that the Elliot operation permits, as a rule, the breadth of opening of the filtration angle or the breadth and depth of the iridectomy which is necessary to be fully effective. If there is one place in ocular surgery where radicalism must enter it is in the cases of typical amaurotic excavations in glaucomatous degeneration. Accordingly, in the simple cases, my sclerectomy is made about as small as can be done easily with the Graefe blade, but in the cases showing progressive degeneration I use the full width sclerectomy as advised by Lagrange and believe that my results have justified the really minor risks.

It is well recognized that the relief of hypertension is the relief of only one part of the syndrome of glaucoma. The prevention or halting of the other important element, optic atrophy, very often follows the successful relief of hypertension. The cases yet to be mastered are those where the atrophy is progressive, regardless of the degree of reduction of ocular tension. The mastery of such cases probably will come through earlier diagnosis and earlier and more radical operation.

INDICATIONS FOR SURGERY IN PULMONARY TUBERCULOSIS*

By H. E. SCHIFFBAUER, M. D.
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DISCUSSION *by Harold Brunn, M. D., San Francisco; William B. Faulkner, M. D., San Francisco; E. W. Hayes, M. D., Monrovia.*

THE purpose of this paper is to discuss the selection of patients suffering from pulmonary tuberculosis who are suitable for surgery.

The term "surgery" is applied to the various methods of extrapleural thoracoplasty, operation on the phrenic nerve, external and internal pneumolysis. The application of these methods will not be considered.

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Surgery in pulmonary tuberculosis is based on a sound physiological principle and an accurate knowledge of its pathology. The object of all surgical interventions is to obtain a relaxation of the lung, with the ensuing atelectasis which places the diseased lung at rest, obliterates cavities and decreases the toxemia, increases fibrosis and so secures scarring and retraction.

It must be impressed upon the patient that the operation does not eradicate the diseased lung but only assists the patient in increasing his resistance and in preventing reinoculation and hemorrhage.

If surgery is confined to the ideal cases, operation will be refused to many who would be benefited by it. Results from operation on improperly selected cases will be unfavorable and a discredit to surgery.

POINTS FOR CONSIDERATION IN SELECTION OF CASES

Resistance.—The selection of patients suitable for surgery is of the utmost importance. It requires a careful consideration of all the phases of pulmonary tuberculosis, especially the immunological reactions, and the closest collaboration with a tuberculosis specialist.

The accurate estimation of the patient's resistance to surgery as manifested by the various clinical symptoms, with a clear understanding of the immunological processes, will greatly assist in the selection of the appropriate time for operation.

Interpretation of Roentgenograms.—The correct interpretation of a series of roentgenograms, taken over a period of months is of extreme importance. A decision should not be based upon a few plates. It is advisable for the surgeon to make an exacting study of the roentgenograms with a competent roentgenologist. Such study, made over a period of years, will aid him in the selection of cases, the type and extent of surgery to be performed.

Physical Findings.—The physical findings and clinical observations are perhaps of more importance than the roentgenological studies. The surgeon should be adept in the use of the stethoscope. It will often prevent him from operating on unsuitable cases.

The pathological condition of the diseased lung is an important factor. For our consideration it is sufficient to classify pulmonary tuberculosis into two groups: the exudative and the proliferative fibrotic types. The primary tuberculous lesion of the lung is always exudative. When the initial lesion is slight, with good resistance, it readily changes into the proliferative type with a tendency to fibrosis. The less resistance produced by the patient the more extensive the exudative lesion. After the initial lesion, dependent upon the extent of infection and the patient's resistance, there always exists the mixed form. It is important to know whether the exudative or the proliferative type predominates, and to what extent. Experience has proved that surgery in the preponderant exudative lesion gives the poorest result, whereas in the slow progressive proliferat-

ing type the best results have been obtained. Operation in the stage of defense is inadvisable. It is only after this stage has been passed and the patient is not making satisfactory progress that surgery should be taken into consideration. Further procrastination is inconsistent with the experience of the present results from surgery.

INDICATIONS FOR SURGERY

1. Unilateral chronic fibrotic ulcerative tuberculosis with or without cavities, in which conservative methods have failed, with a contralateral lung which has no activity in the apex, nor the presence of a hilar, or lower lobe lesion is a condition favorable for surgical intervention.

2. Some cases, with a basal exudative lesion, which are progressive, with extensive pleural adhesions, with a normal contralateral lung, in young patients, with good resistance may be considered. Extreme care should be exercised in the selection of the exudative cases. The highest mortality and the poorest results follow surgical interference.

3. Hemoptysis is not an indication for urgent surgery. As a rule, strict rest with other conservative treatment is usually sufficient to arrest the bleeding.

Repeated hemorrhages in suitable cases are greatly benefited by surgery. Internal pneumolysis is effective when an incomplete pneumothorax, due to adhesions, prevents the compression of the diseased lung which is bleeding.

Phrenic interruption will often control repeated hemorrhage from cavities. Extrapleural thoracoplasty is an efficient method of permanently stopping bleeding in the chronic ulcerative diseased lung.

4. Tuberculous empyema with mixed infection, in which conservative methods have failed, calls for surgery. In this condition we cannot be too particular about the contralateral lung.

5. Incomplete pneumothorax is helpful for a unilateral involvement which is not making satisfactory progress.

6. Early surgery will prevent the development of empyema and save many patients with a pleural effusion, secondary to artificial pneumothorax with or without tubercle bacilli, which accumulates after repeated aspirations, and in which expansion does not take place after the withdrawal of the fluid. Ordinarily 15 per cent of these patients would develop empyema.

7. Spontaneous pneumothorax with bronchial communication is helped by the intervention of surgery.

Too much consideration of the existing pathological condition of the involved lung should not be given, but more attention to the patient's resistance to surgery. Individuals with bad family history of tuberculosis are poor operative risks. The emaciated and the obese patients do not tolerate surgery and, if possible, their condition should be improved.

The outward signs of fibrosis of the lung, manifested by the narrowed and insunken intercostal spaces; marked supra- and infraclavicular grooves; atrophy and slight rigidity of the muscles attached to the anterior and posterior chest walls; these, associated with the roentgenological findings of a deviation of the trachea to the affected side, fixation of the mediastinum, a rising of the diaphragm, and a drawing over of the base of the heart, are indications that every effort is being made by nature to put the diseased lung at rest, but that further aid is required.

CONTRALATERAL LUNG

Patients with unilateral tuberculosis are seldom seen by the surgeon. Surgical need is not a question of whether one lung is free from disease, but it is a question of the type, location, extent, probable duration, and whether there is any activity.

It is obvious that any diseased condition of the good lung requires adequate observation; if the condition is progressive, surgery is contraindicated; should the disease remain stationary, or be retrogressive, graded surgery may be considered.

It is not unusual to observe improvement in the contralateral lung after a phrenicectomy, and a continued improvement after a complete thoracoplasty has been performed.

It is in this class of patients that the test operation of phrenicectomy is of value. After the diaphragm is paralyzed and the patient has an elevation of temperature, increase in pulse rate, and moisture over the suspected area, further surgery is contraindicated at this time.

The existence of a chronic disease of the good lung, such as emphysema, chronic bronchitis, bronchial asthma, bronchiectasis, extensive adhesions between the base of the lung and diaphragm, is a contraindication for surgery.

CONTRAINDICATIONS TO SURGERY

In Early and Late Cases.—Early cases in the defense stage, and advanced bilateral cases, are an absolute contraindication.

Lack of Defense Mechanism.—Constitutional symptoms, manifested by a high temperature, rapid pulse rate, increased respiration, dyspnea, cyanosis, a low blood pressure, are all symptoms indicating exhaustion, with a complete breakdown of the defense mechanism. Surgery will hasten the end.

Blood Picture.—A gradual decrease of the erythrocytes, low hemoglobin, increase in the lymphocytes, with a continued absence of the eosinophils, and a decrease in the sedimentation time, are all factors indicating a failing resistance.

Age.—Operations should be limited to patients between the age of fifteen and forty-five. The best results are obtained between the age of twenty and thirty-five. Age is, however, not an important factor in the selection of cases. Patients at the age of twelve and fifty-seven have been operated.

Choice in Left and Right-sided Operations.—Operations on the left side give better results than

on the right. The left lung, consisting of two lobes, smaller in volume, assisted by the heart in aiding compression, are the important factors in determining the end-result. Cardiac embarrassment is more frequent when operation has been on the left side.

Circulatory System Contraindications.—A persistent pulse rate over one hundred, with a blood pressure under a hundred, is a relative contraindication to major surgery.

Myocardial degeneration is an absolute contraindication to thoracoplastic operations. Valvular lesions without myocardial damage are satisfactory risks. In all doubtful heart conditions an electrocardiogram is a valuable aid in estimating the patient's resistance to surgery. After a thoracoplastic operation an additional amount of work is placed on the heart, first, by the displacement of the heart; second, by an increased resistance in the lesser circulation; and third, by the autotuberculization of the patient, causing an increase in the heart rate.

Kidney Impairment.—Patients with kidney conditions which give an impaired functional test, with changes in the blood chemistry, should not be submitted to major surgery. A mild degree of toxic albuminuria is not a contraindication.

Tuberculosis of the Intestines.—A mild chronic tuberculous condition of the intestines which does not interfere with proper nutrition is not an absolute contraindication. A tuberculous ischiorectal abscess should not deter one from considering major surgery of the chest.

Tuberculosis of Other Organs.—Tuberculosis of the larynx, with a severe perichrondritis is a relative contraindication; a mild laryngeal tuberculous involvement usually improves after a thoracoplasty.

Chronic tuberculosis of the bones, joints, or skin are not an absolute contraindication to surgery.

SUMMARY

This paper is a plea to that group of physicians who are well informed on the results that have been accomplished by surgery but have not had the courage to abandon their conservative treatment in chronic destructive processes of the lung which show no improvement. May they reconsider these cases, realizing that they can save many from an early death, cure at least one-third, improve another third, and prevent an enormous economic loss of time and money.

The selection of cases is of paramount importance, but the end-results will be in direct proportion to the surgeon's skill in his preoperative management, his operative technique, and the postoperative treatment.

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DISCUSSION

HAROLD BRUNN, M. D. (384 Post Street, San Francisco).—Doctor Schiffbauer has given us in a masterful way the indications and contraindications for the adoption of surgery in pulmonary tuberculosis. We will, therefore, not discuss the operative procedures themselves, but confine ourselves to the subject as outlined by him in his paper.

I am glad to note the very evident conservatism which marks the work of Doctor Schiffbauer. The general surgeon taking up this type of work must more or less reconstruct himself and take a different attitude than has been his custom in his ordinary surgical work.

Patients suffering from tuberculosis that are brought to his attention for surgery require careful study, long observation, and consideration of preliminary procedures before the major operation is undertaken, and a close association with the specialist. This is not the place for quick judgments and dogmatic generalization. Each case must be decided upon its own merits.

As has been pointed out, certain groups of these patients do not respond to surgery; on the contrary a surgical procedure may, in one of several ways, tend to extend the disease. I think I can say that where we have undertaken surgery with grave doubt that, for the most part, we have had regrets.

We believe that thoracoplasty and phrenicotomy are two surgical procedures of great value in well-chosen cases, and will shorten the time of cure that cannot be obtained by other methods.

We quarrel at times with the tuberculosis specialist who, although a believer in collapse therapy (artificial pneumothorax), still persists in this when it is not bringing about a result, either because of adhesions or other factors, and refuses to accept thoracoplasty which so perfectly meets the requirements.

Theoretically they admit the value of the operation but practically they refuse to submit their patients to it. The line of cleavage lies in the fact that they believe these patients will with rest and time get well, as many have, and that thoracoplasty, while it may hasten recovery, might throw them over on the other side and they refuse to take the chance.

We who believe in thoracoplasty think that the tuberculosis specialist fails to give a certain proportion of his patients the advantage of this operation and waits too long until finally the indication for it has passed.

Education is necessary on both sides. We believe there is a common ground, but this can only be accomplished by intimate association and discussion.

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WILLIAM B. FAULKNER, JR., M. D. (University of California Hospital, San Francisco).—The value of collapse therapy in pulmonary tuberculosis has already been definitely established. The successful outcome in many cases following artificial pneumothorax has been recognized by all familiar with this type of work. There is a group of cases, however, in which pleural adhesions so fix the lung to the diaphragm and chest wall as to interfere with an efficient collapse by artificial pneumothorax alone. It is in this group that section of the phrenic nerve or thoracoplastic procedures find their greatest use. As has been pointed out by Doctor Schiffbauer, the success to be obtained following these surgical measures is in direct proportion to the care employed in the selection of cases and the choice of operative procedure. This selection of cases calls for the greatest coöperation between the chest specialist, thoracic surgeon, and roentgenologist.

It is by such coöperative work that exceptional improvement often follows the use of surgery. There are a few scattered cases, however, in which surgical treatment is followed by a persistence of the symptoms, or an extension of the patient's disease. The unfavorable impression which these present leads to a hesitancy in recommending surgery for other patients in whom all the indications are present for an operative improvement.

If symptoms persist following operation they are as a rule due to an incomplete collapse of the diseased lung. The localization of the remaining disease within the lung can sometimes be made by the injec-

tion of bromifin into the tracheobronchial tree or by bronchoscopic examination. Further operative procedures aiming at collapse should then be carried out at the site at which bromifin has localized the disease. We have had one such patient who had an incomplete relief of symptoms following section of the phrenic nerve and posterior thoracoplasty. (The sputum had been reduced from two cups to one-half cup a day.) The remaining disease was localized in the anterior portion of the chest. An anterior thoracoplasty was then done, and the patient had an immediate and complete relief of all symptoms. This particular patient illustrates the need for further surgery rather than less surgery in certain instances that fail to improve with the usual operative procedures.

The extension of the disease following surgery has been attributed to the aspiration of pus from the compressed area of the diseased lung with resulting aspiration bronchopneumonia. This can be prevented if the patient is bronchoscoped immediately before the chest operation so as to remove pus from the diseased areas. This procedure can readily be done in a very few minutes under local anesthesia without pain and with little discomfort to the patient.

We believe that with the employment of the bronchoscope, the use of bromifin, and the adoption of further operative procedures, the favorable results following surgery should be even more marked. However, as Doctor Schiffbauer emphasizes, surgery does not give an immediate cure of the disease; the patient still has tuberculosis and should continue medical care and general tuberculosis regimen long after the operative convalescence

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E. W. Hayes, M. D. (129 North Canyon Drive, Monrovia).—Surgery in pulmonary tuberculosis, as Doctor Schiffbauer has pointed out, is based on sound physiological principles. Artificial pneumothorax has demonstrated the effectiveness of collapse therapy in this disease and, as a consequence, it stands out today as the one great addition to our therapeutic armamentarium in this field during the past twenty-five years.

Collapse of the lung by surgical measures, while yet relatively new in its application, bids fair to take its place alongside induced pneumothorax as another real addition to the therapy of pulmonary tuberculosis. Chest surgery, however, is considered and applied, for the most part, only when pneumothorax cannot be effectively induced. It is a more serious undertaking than pneumothorax. Consequently it requires more careful study and selection of cases.

Doctor Schiffbauer has covered the points to be considered in this selection so thoroughly,and brought out his points so clearly that I can add but little to what he has said. As an internist dealing entirely with chest conditions, I do want to emphasize one or two of the points he has made.

We must bear in mind the importance of a careful study and an understanding of cases of pulmonary tuberculosis that are to be subjected to surgery lest, on the one hand, it will be denied to those who could be benefited by it, and, on the other, it will be applied to cases unsuited and will bring this means of therapy into disrepute. There should exist the closest collaboration between the tuberculosis specialist and the chest surgeon, or better still, as the doctor has said, the chest surgeon should familiarize himself with the physical signs and clinical course of pulmonary tuberculosis and the chest specialist should aim to familiarize himself with those factors which a patient must withstand when subjected to the additional and always severe strain incident to surgery of the chest. Under these circumstances the chest specialist will be in a position to intelligently select patients for surgical consideration; while the chest surgeon will then be able to render to his patient a more intelligent and more effective preoperative study and care, and postoperative management.

INFECTION OF ABDOMINAL WALL WITH B. WELCHII FOLLOWING ENTEROSTOMY FOR BOWEL OBSTRUCTION*

REPORT OF CASES

By Edmund Butler, M. D.
AND
George Rhodes, M. D.
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DURING the last five years one hundred and eighty patients have been operated upon for bowel obstruction. Many of these patients came into the hospital late and frequently enterostomy was performed. We have always strongly advocated enterostomies in the first loop above the region of the obstruction in late cases. The improvement following enterostomy has been so obvious that we are inclined to make use of it in many patients who would recover without drainage. The opening of the bowel under the most perfect technique results in contamination of the peritoneum and the wound.

B. welchii or other pathogenic anaërobes are always present in the lower ileum. This finding is the observation of many careful investigators. Dudgeon cultivated *B. welchii* from the stools of 35 per cent of two hundred ward patients. Williams cultivated *B. welchii* from the vomitus of eleven out of nineteen cases of bowel obstruction, from nineteen out of twenty advanced cases, and no growth of *B. welchii* from the vomitus of three patients with pyloric obstruction. In a reprint of patients treated with gas gangrene antitoxin, Williams shows a reduction in mortality in appendicitis from 6.3 to 1.17 per cent, and in bowel obstruction from 24.8 to 9.3 per cent, crediting the use of gas gangrene antitoxin for this remarkable reduction.

Spinal anesthesia is particularly suitable for patients suffering from bowel obstruction. The use of spinal anesthesia, and the milking of bowel contents into the colon, from which the toxic material is rapidly evacuated, will greatly reduce the number of enterotomies and enterostomies. Many border-line cases will clear up without operation following the use of spinal anesthesia.

Organic intestinal obstruction is a surgical condition requiring an early diagnosis and early operation. Tissue fluids and chlorid lost by vomitus must be replaced by intravenous and subcutaneous salt solution. Tube drainage of the stomach is advisable; the tube should be left in place as long as nausea is present. Enterostomy may be replaced in certain cases by threading a long stomach tube of large diameter through anus, rectum, sigmoid, ascending colon, transverse colon, and descending colon. Through this tube fluid contents and gas may be evacuated.

The use of *B. welchii* antitoxin, as advocated by Williams, has a very definite place in the treatment of severe toxemia following bowel obstruction, and many investigators not so impressed

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